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**Dismissive and deceptive car dealerships create barriers to electric vehicle adoption at the point of sale**

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**Abstract:** This study investigates the role of car dealerships in the electrification of passenger transport, namely their sales advice about the purchase and use of electric vehicles (EVs). Because most consumers do not have pre-existing knowledge of EVs, and current market conditions favour petrol and diesel vehicles, car dealership experiences may strongly influence EV purchasing decisions. Here we show that car dealerships pose a significant barrier at the point of sale due to a perceived lack of business case viability in relation to petrol and diesel vehicles. In 126 shopping experiences at 82 car dealerships across Denmark, Finland, Iceland, Norway, and Sweden, we find dealers were dismissive of EVs, misinformed shoppers on vehicle specifications, omitted EVs from the sales conversation and strongly oriented customers towards petrol and diesel vehicle options. Dealer's technological orientation, willingness to sell, and displayed knowledge of EVs were the main contributors to likely purchase intentions. These findings combined with expert interviews suggest that government and industry signalling affect sales strategies and purchasing trends. Policy and business strategies that address barriers at the point of sale are needed to accelerate EV adoption.

Electric vehicles (EVs) have great potential to contribute to the decarbonisation of society and help achieve national and international climate targets by reducing emissions of both the transport sector, which accounts for one fourth of energy-related global greenhouse gas emissions, and the electricity sector, via better integration and utilisation of renewable energy sources<sup>1-6</sup>. In turn, a growing stream of research has explored the social, political and market implications and barriers to EV diffusion and use<sup>2,7,8</sup>; from taxation and policy incentives<sup>9-11</sup>, to consumer-focused studies<sup>12-14</sup>.

However, the retail relationships of the EV market, in particular the interaction between industry actors such as automotive original equipment manufacturers (OEMs), dealerships and prospective EV owners at the point of sale, have been under-explored. Dealers represent an important yet understudied intermediary between new innovations like EV technology and consumers. Only three North America-focused studies exist as of 2017, and these either feature smaller sample sizes, lack cross country comparisons or focus on early EV adopters<sup>15-17</sup>. For instance, a California-specific (US) study suggests that EVs require new business and promotion strategies during sales processes<sup>15</sup>, where two separate studies across four US States<sup>16</sup> and an investigation in Ontario (Canada)<sup>17</sup> find that the (lack) of salespersons EV knowledge and positive attitude can influence customers purchasing decisions.

Despite this dearth of research coverage, the role of industry actors is important because research suggests that current EV buyers can be categorised as early adopters with a higher technological acumen and knowledge of EVs<sup>18,19</sup>, implying that they may aggressively and actively pursue EVs at the selling point. Early adopters, however, are a minority of the total market. Therefore, car dealerships and EV purchasing experiences at the point of sale may be where a majority of consumers first encounter the technology and also consider purchasing it.

For this reason, we investigate the prospect of purchasing an EV from the perspective of an average or mass market customer in 126 dealership shopping visits at 82 car dealerships across 15 cities in the five Nordic countries (Denmark (DK), Finland (FI), Iceland (IS), Norway (NO) and Sweden (SE)) triangulated with industry stakeholder interviews across these countries. We also analyse the effect of location-specific factors on EV purchases, such as the comparison between urban and rural settings, and the different tax, regulatory, commercial and social conditions of each country. This includes comparisons between the EV global leader Norway, an intermediate adopter (SE), and less developed EV markets of FI, IS, and DK. The latter is the first country to reintroduce taxes on EVs<sup>20,21</sup>.

Our results indicate that national policy and signalling, both from government and industry, substantially affect the EV purchase likelihood at the point of sale. Although all the investigated countries are known for being international leaders in the area of energy and climate policy<sup>20</sup> and have various EV incentives in place, we find these are ephemeral when compared to petrol and diesel vehicle incentives, with the exception of Norway. Thus, EVs tend to be a comparably less attractive option both for the dealership to sell and the customer to buy. As a result, these unfavourable market conditions for EVs are in turn reflected in dealer sales strategies, where we find a lack of willingness to sell EVs to mainstream customers.

## **Research approach**

Our research team posed as “mystery shoppers” (see Methods) and therefore remained neutral and showed no initial inclination to any particular type of passenger vehicle. This neutral approach tests the direction and level of orientation in which sales personnel guide mainstream

customers to or away from EVs. To ensure validity, the shopping encounters were triangulated with 30 expert interviews with major automobile manufacturers, importers and associations, and other related organisations such as EV charging stations providers across the Nordic region. These interviews were taken out of a pool of 227 interviews with 257 expert participants on electric mobility more broadly in the region (see Methods)<sup>22,23</sup>. We refer to the mystery shopping experiences by visit number (e.g., V12) and the interviews by respondent number (e.g., R22).

First we highlight the data from our mystery shopping experiences coupled with complementary evidence from our expert interviews. Then we provide inter-country analysis based on ANOVA tests comparing salespeople's quality in selling, technological orientation, EV knowledge and the likeliness of customers purchasing an EV. This analysis highlights the impact of market conditions across the five investigated countries. Lastly, we use regression models to determine the factors that most influence the EV purchase likelihood.

### **Dealer disbelief and business barriers**

Due to a perceived worse business case for EVs in comparison with petrol and diesel vehicles, dealerships and sales personnel pose a significant barrier for their uptake. Indeed, more than half of our expert interviews noted that both the car dealership and sales personnel lack a willingness to sell EVs because of anticipated low profitability, lack of knowledge and competence to sell, and extended sales time per EV purchase, in comparison with internal combustion engine vehicles (ICEVs).

Out of the total 126 dealership visits conducted, only 8.8% of the mystery shopping encounters resulted in the shoppers having preferred an EV option for their next car purchase over an ICEV; this drops to just 2.9% outside of Norway. More strikingly, in the 77% of the car dealerships visits that had EV brands and EV models available, the salesperson did not discuss the existence of their brand's EV. In Table 1 we present the most common barriers found by the mystery shoppers while conducting the visits (see Methods), with the top three being: salespersons at car dealerships dismissing EVs, misinforming shoppers on EVs attributes, and neglecting to mention EVs in the sales conversation.

Thus, a typical customer would have remained incognisant of the existence of EVs or misinformed about their performance. As an example, both dismissiveness of EVs and misinformation were evident in Visit 37 (V37), as a salesperson initially mentioned "*we don't have any [EVs] ...they are more expensive, so they are probably not worth it*". But, when the shopper later pressed the topic of EVs, the salesperson acknowledged "*oh yeah, that's true, I do have a 100% electric [vehicle]*", though still completely disregarded it as a viable alternative.

Hence, customers that are not familiarised with electric vehicles would have likely remained incognisant about EVs as a purchasing option. This lack of salespersonnel's willingness to include the EV within the sales conversation was further corroborated with our interviews, where an expert from a leading EV brand manufacturer (R14) mentioned that only one out of ten of their dealers "*actually tried selling EVs last year*". R08 attributes this omission of EVs to the "*lack of willingness of the [salespersonnel] to actually promote [a] new technology*". Thus, a policy that requires OEMs to carry EVs within dealerships without the corresponding economic incentives would not necessarily result in more EV sales.

Barrier	Freq.	Example
<b>Dismissive of EVs</b>	28	V86 – “the economics of fuel efficiency doesn’t make sense”, which was a bit contradictory, because later the dealer said “electricity was very cheap, so you would think that EV drivers would spend less on fuel [/power]”.
<b>Misinforming the customer</b>	24	V22 – “we have this electric vehicle”. The dealer showed us an EV and said “it only goes 80km”.
<b>Neglecting to mention EVs</b>	22	V103 – Dealer said “no we don’t have this, you can only get this in petrol and diesel” even though the shopper saw a brochure for EVs on the counter.
<b>Depicting EVs as an inferior option</b>	14	V22 – “do not buy this [EV] it will ruin you, it will ruin you financially”.
<b>Lack of EV availability and visibility</b>	12	V64 – The shopper saw a flyer for a Nissan Leaf, but the dealership did not have it in stock.
<b>PHEVs and hybrids are not optimal for decarbonisation</b>	12	V111 – “most people just buy that because of the tax breaks and only use petrol and don’t really use the electric part of it”.
<b>Stating that the tax system favours conventional vehicles</b>	11	V24 – “if the diesel car is already tax free for 5 years, then means that it should be pretty environmentally friendly...[because] the government is quite strict for diesel and petrol engines, in terms of how much they pollute. So if these ones are below the limits of the government it must mean they are very environmentally friendly”.
<b>Stating that the economics work against EVs</b>	11	V99 – “but I’m not sure if an EV would equate to financial savings, if you get more capital cost upfront with less tax would eventually mean less money overall. Because...you’re giving the money now, but the savings are in the future, you don’t know what’s going to happen, what if you change car or in 10 years it’s not really there”.
<b>Lack of models for segments</b>	10	V124 – “if you do need the 4-wheel drive or interior space, go with the station wagon or SUV, not the EV”.

**Table 1. Barriers to electric vehicles at car dealerships.** The frequency of instances (N = 92 statements collected by the research team) in which salespersons made statements falling into one of nine categorical barriers, with examples.

In two-thirds of all shopping experiences, sales personnel strongly or solely oriented the customer to select a petrol or diesel vehicle, and actively dismissed EVs, even when dealerships had electric vehicle options for sale. For instance, in V82 the salesperson directed the shopper away from the full EV twice, with the dealer repeating “no you should buy this car instead”. In directing customers away from EVs, we found several instances where dealers misinformed shoppers on EV specifications, such as range, tax benefits and charging experiences. For instance, in V70 the dealer said the range of the new E-golf was only 150km when the OEM advertises online a range of 300km in controlled conditions and 200km on regular driving<sup>24</sup>. In V1, the salesperson told the shopper a 350km journey would take 2 days to complete because of charging times, but when asked for clarification later, admitted charging would add only about 2-4 hours.

Such misinformation is also tied to a low level of displayed knowledge by dealers: in 71% of the visits dealers demonstrated either low displayed knowledge or no knowledge at all. However, low knowledge of EVs may be related to the lack of training and educational programmes for salespersonnel. For instance, in our interviews R09 mentioned that some

dealerships cannot sell EVs because corporate strategy targets EV training for only a portion of the dealerships where salespersonnel “*know nothing on charging infrastructure, nothing on the electricity or carbon emissions*”. To this end, R13 noted that “*if you do not have the right tools or education [to sell EVs] ...then you will try to sell the other car that you know by heart*”.

The aforementioned barriers found in the mystery shopping visits potentially derive from currently unfavourable market conditions for full EVs in relation to ICEVs and even plug-in hybrids (PHEVs), as EVs are undoubtedly a more expensive option. As R18 mentioned, in countries like “*Sweden and Finland, the gap between these two technologies [EVs and ICEVs] is easily more than 10,000 euros*”. In addition to the disparity in purchase price, although most countries have some moderate benefits for purchasing an EV (outside of Norway), incentives still more strongly favour ICEVs. For example, in V36, the dealer noted that “*the government likes petrol engines because there’s not a lot of tax, [they are] very efficient, not a lot of emissions*”, based on the fact that some petrol and diesel cars receive a tax exception for 5 years after purchase. Likewise, in V2, where EVs had a tax exemption, the dealer dismissed such benefits, noting that “*road tax is not really that high anyway*”.

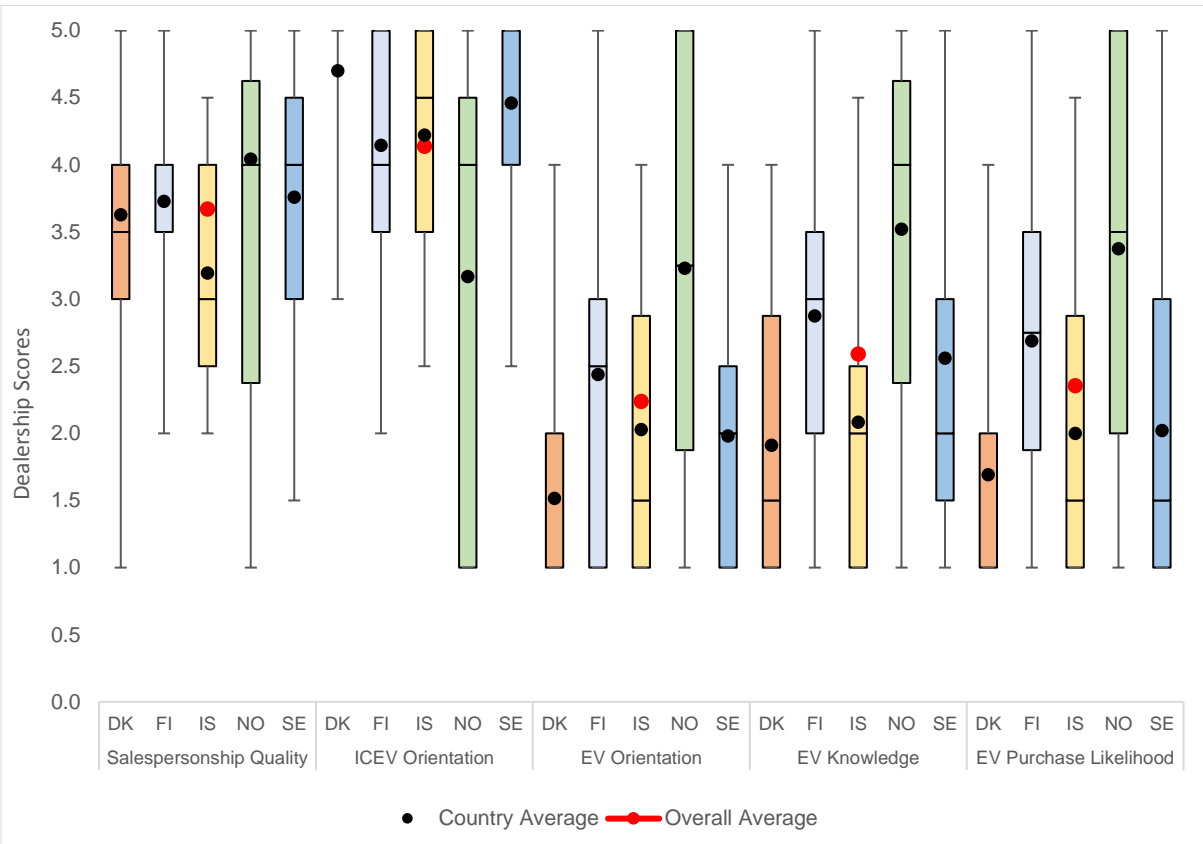
Perhaps unsurprisingly, salespeople tended to promote the vehicle that is easier to sell, which outside of Norway, was undoubtedly not an EV. Correspondingly, R15 noted that salespeople do not introduce EVs to the customer because “*it’s more difficult to sell*”. In addition to the price disparity between EVs and ICEVs, four of the interviewed OEM managers also noted the difficulty of selling, as EVs can take 2-4 times longer per customer compared to a typical ICEV. In this sense, our interviewees noted that “*there are much more questions*” (R16) before and post-sale and where sales personnel “*have to become consultants*” (R12) developing competences and new selling strategies, both of which detracts their willingness to promote EVs.

### **Geographic heterogeneity and country comparisons**

Following each visit, the mystery shoppers ranked each visit on quality of salespersonship, technological orientation, knowledge, and purchase likelihood. In Figure 1 we show the least square means (LSMEAN) score of each country on these measures (see SI, Supplementary Note 2 for more information). When analysed at a geographic and regional scale, government policy and signalling seem to trickle downstream to the automotive retail level, which is evident when we consider the implications that different EV market conditions have on the point of sale within car dealerships.

The quality of salespersonship was relatively stable across the countries, with Iceland (LSMEAN=3.2 out of 5.0) and Norway (4.0) recording the lowest and highest scores (Figure 1), suggesting that the disparity in market conditions between EVs and ICEVs affects the willingness of car dealerships and salespeople to sell electric vehicles. Quality of salespersonship was assessed based on the overall perceived ability, attitude, enthusiasm and professionalism of the salesperson while providing sales advice and attending to the shopper<sup>25</sup>. There was a statistically significant difference between Norway (LSMEAN=3.2) and the other Nordic countries in the dealer’s EV orientation (LSMEAN in DK=1.51 ( $p<0.0001$ ), FI=2.44 ( $p=0.007$ ), IS=2.03 ( $p=0.007$ ) and SE=1.98 ( $p=0.0001$ )), which may reflect Norway’s leadership in pro-EV incentives, and the less favourable EV market conditions in the other countries. Danish dealers oriented their customers most prominently towards ICEVs, perhaps reflecting the recent decision of the Danish government to tax EVs<sup>21</sup>. This political decision may have created the greatest disparity in the Nordic region between EV and ICEV conditions

of the investigated countries, which is reflected in the difference between Denmark's ICEV and EV orientation scores, with LSMEAN values of 4.7 and 1.5 respectively.



**Figure 1. Average salesperson rankings for electric vehicles in the Nordic region.** Least square means scores for all five Nordic countries on quality of salespersonship, technology orientation, knowledge, and purchase likelihood, ranked on a Likert Scale from 1-5. The black dot shows the country average for a particular dealer ranking, and the red dot shows the overall average across countries. The lower and upper tildes show the minimum and maximum values per dealership score. Note: EV = electric vehicle. ICEV = internal combustion engine vehicle. DK = Denmark. FI = Finland. IS = Iceland. NO = Norway. SE = Sweden.

The level of EV orientation and EV knowledge were significantly different between the scores of Norway (LSMEAN=3.52) and Denmark (LSMEAN=1.91,  $p<0.001$ ), Sweden (LSMEAN=2.56,  $p=0.001$ ) and Iceland (LSMEAN=2.08,  $p=0.004$ ). Interestingly, Finland was not significantly different from Norway, with a LSMEAN score of 2.88 ( $p=0.29$ ) on these variables, which may reflect the recent government commitment towards electrification, with a target of 250,000 vehicles by 2030 as well as the industry developed around EV ecosystems<sup>26</sup>. Perhaps as a result of recent changes to Danish vehicle incentives<sup>27</sup>, Danish dealers oriented shoppers the least towards electric vehicles and showed the least displayed knowledge. This was evident in the many occasions where Danish dealers would recognise EVs but note that they were by far the least economic option compared to an ICEV. Notably, Denmark's ICEV orientation (LSMEAN=4.7,  $p=0.021$ ) and EV knowledge (LSMEAN=1.91,  $p=0.017$ ) scores were significantly different than those for Finland (ICEV Orientation=4.1, EV Knowledge=2.88), a country with fewer EVs in the national fleet, less developed charging infrastructure, and strong commitments to biofuel technology<sup>26</sup>. The disparity between the (strong) ICEV (LSMEAN=4.6) and (low) EV orientation (LSMEAN=1.98) of Swedish dealers marks the second biggest difference between technological orientations, after Denmark, which

may be explained by the taxation system that promotes company leasing EVs (as opposed to private leasing and ownership), and the apparent legacy of its automotive brands<sup>28</sup>.

Considering the results of Figure 1, it is unsurprising that Denmark ranks poorly compared to Norway and also Finland in terms of EV purchase likelihood. This finding corroborates the near non-existent sales figures of EVs in the country since the recent introduction of vehicle registration tax<sup>20,21</sup>. Clearly, though, this does not mean EV technology is difficult to sell, given the improved likelihoods in Norway and even Finland, a country where EVs arguably may not fit the transportation demand as well as in Denmark. Despite Finland arguably has worse natural conditions for EV implementation than Denmark –colder weather, more scattered population settlements, less renewable energy supply and longer vehicle turnover cycles –the nation is still ranked second in the region in the likelihood of purchase (LSMEAN=2.7/5.0). These results suggest that policy mechanisms, government and industry signalling and promotion are evident downstream at the selling point and affect sales strategies and purchasing of electric vehicles.

### Purchasing likelihood among adopters and demographic variables

Finally, we implemented a set of multiple regressions to model the factors influencing EV purchase likelihood at the point of sale, with the best fitting model shown in Table 2 (see SI, Supplementary Note 3). This implies that a successful transition to EVs is most influenced by the EV orientation of the dealer to sell the vehicle and the displayed EV knowledge. The latter involves communicating the benefits of EV ownership which a neutral buyer may not be aware of. For example, in V112 the dealer mentioned “*insurance is 40% cheaper than comparable petrol or diesel*”; or in V21 where, despite not having EVs available to sell, the dealer spoke from their experience noting they “*didn’t know they can drive that far...it wasn’t that much of a problem to drive [from Gothenburg] all the way to Stockholm*”. Moreover, whether EVs were mentioned is also influential. This refers to the fact that the dealer did not omit the EV, and recognised it within the sales conversation, regardless of whether it was the final vehicle option advised to the shopper.

Parameter	DF	Estimate	Standard Error	t Value	Pr >  t
<i>Intercept</i>	1	0.044117	0.117659	0.37	0.7084
<i>EV orientation</i>	1	0.820112	0.059037	13.89	<.0001
<i>EV knowledge</i>	1	0.128151	0.060371	2.12	0.0358
<i>EV brand availability (EV Brand)</i>	1	0.152927	0.108293	1.41	0.1605
<i>EV mentioned (EV Said)</i>	1	0.314911	0.163328	1.93	0.0562

**Table 2. Regression Model Estimates of EV orientation, knowledge, and branding.**

Parameter estimates of best fitting one-way interaction model. Note: EV = Electric Vehicle.

Other variables such as the gender of the dealer, the socio-economic profile of the EV shopper, the brand specificity of the dealership (if the dealership was multi-brand or brand-specific) and the location (country and city) were not significant determinants of the EV purchase likelihood.

Notably, there is no significant difference between the urban and more rural settings primarily located in the northern regions such as Akureyri (Iceland), Trømso (Norway) and Oulu



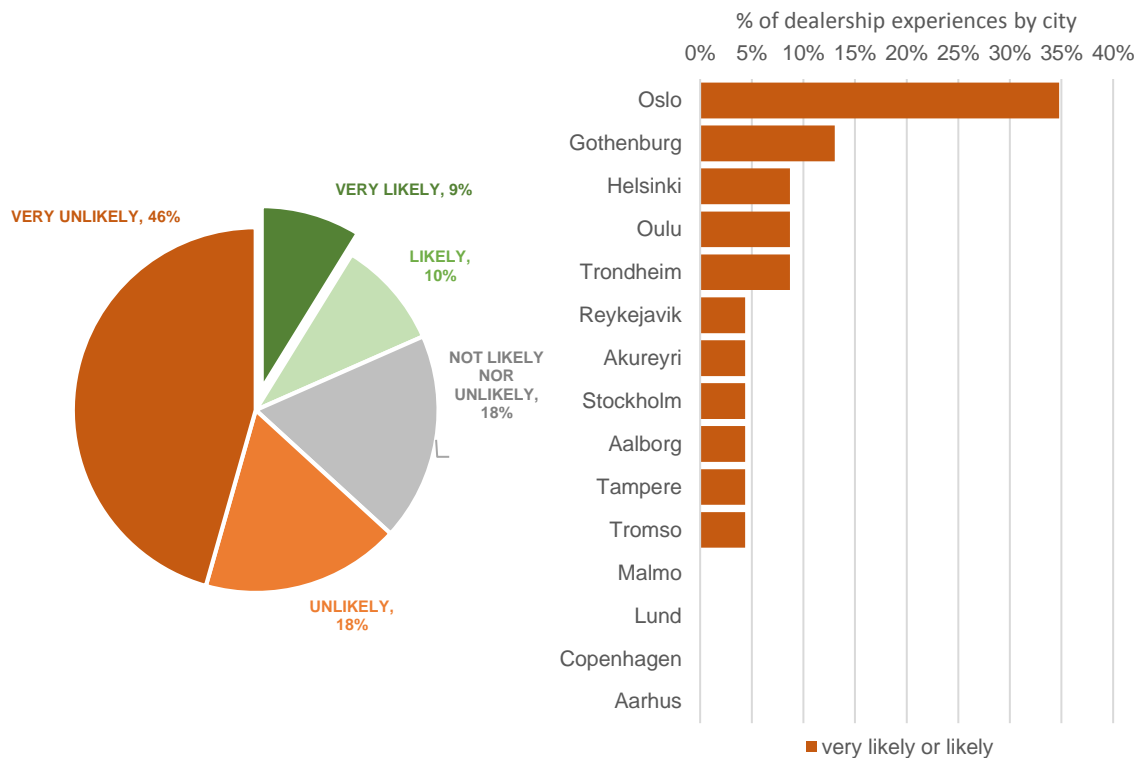
(Finland). This contrasts with the idea that EVs are a better suited as a city car, and thus OEMs and car dealerships prioritise selling efforts on urban locations, as stated by R22. This was evident in Finland, as we found that a couple of major OEMs restricted full electric vehicle availability for sale to the greater metropolitan area of Helsinki. Thus, the dealerships visited in Tampere and Oulu could only suggest that a shopper travels 200-600 km to see or test drive a full EV model. Consequently, as the likelihood of EV purchase was not significantly different between these cities, suggesting that urban-based dealers were comparatively worse at promoting and selling EVs than rural-based dealers. This is unexpected given that urban-based dealers have the vehicles available, the infrastructure and certified expertise to sell EVs. This shows that the current intended strategy and promotion at the point of sale does not materialise into urban EV purchases.

The findings of the regression models suggest that car dealerships can increase the likelihood of EV purchase by having their salespersons actually include EVs in the sales conversation, noting the vehicle's attributes and actively mentioning EVs as an available option for purchase. As confirmed in our interviews, more robust training schemes that improve EV knowledge and sales confidence at dealerships, as well as operationalised EV sale processes that improve selling tools and delivery times of products, can encourage salespersons to promote EVs and increase the likelihood that EVs will be purchased.

## **Conclusion**

Car dealerships and sales personnel serve as a major obstacle to the uptake of passenger EVs in the Nordic region, which mirrors industry and government favouritism towards conventional cars and lack of substantial or at least effective policies promoting EV diffusion. Indeed, policy and signalling from government and industry are evident at the point of sale, and in turn create deterrents for car dealerships and salespersons to promote and sell EVs. This is particularly evident as national market conditions create significant differences in the likelihood of purchasing EVs across countries, with Denmark—the only country to have introduced taxation on EVs—performing the worst among its Nordic neighbours. Despite market differences, our mystery shopping and expert interview data show that dealers were dismissive of electric vehicles, misinformed shoppers on vehicle specifications, omitted EVs from the sales conversation and strongly oriented customers towards ICEVs.

In turn, at an individual level, we found that orientation towards EVs and displayed knowledge by salespersons were the most important predictors of customer EV purchase likelihood, and ratings on these variables differed between countries. As Figure 2 reveals, our results suggest that an ordinary consumer would “very likely” or “likely” purchase an EV in less than 16% of the visits, and over one third of these are in one city, Oslo. When broken down further by city, the figures are even more striking—after Oslo and Gothenburg, our study's dealership experiences showed that an ordinary consumer has a 4% chance of adopting an EV, and in some cities—Malmö (Sweden), Lund (Sweden), Copenhagen (Denmark), and Aarhus (Denmark), the percentage is closest to 0. Thus, the likelihood of purchase increases when dealers at least included EVs in the sales conversation and informed the customer of (positive but also negative) EV attributes. This finding directly challenges the popular image that the Nordic region is successfully fostering innovation in electric mobility and diffusion of EV technology, outside of Oslo at least.



**Figure 2. Likelihood of EV purchases by entire Nordic region and selected cities.** Left panel (pie chart) shows how across all dealership visits in only 9% of cases would a typical mass consumer be very likely to purchase an EV. Right panel (bar graph) shows the percentage of dealership visits that resulted in “very likely or likely” across each city. Near 35% of all “very likely or likely” EV purchases occurred in Oslo. The cities of Malmo, Lund, Copenhagen and Aarhus showed 0% “very likely or likely” EV purchases.

Our study also reveals a compelling list of non-technical barriers that need to be overcome if EVs are to be diffused more substantially across the Nordic region, and perhaps elsewhere. Managers, industry experts and dealers believe the lack of willingness to promote and sell EVs derives from their low profitability, lack of EV models on site, lack of knowledge and competence about EV specifications, and that EVs take longer to sell. Given these factors, salespeople opt for the known and easier-to-sell conventional cars. Moreover, EVs were seen to negatively affect dealer profitability, not only from an initial investment perspective (setting up charging infrastructure and additional personnel training), but also due to a decreased need for maintenance and other services and consequent reductions in dealer revenue. These barriers resemble those in North America, in particular the lack of availability of EV models, longer lead times and willingness from salespersons to sell the technology<sup>15–17</sup>.

To this end, we find that policy and business strategy should be developed to amend the barriers at the point of sale and support EV uptake, particularly considering that EVs could accelerate both the decarbonisation of the transport and electricity sectors. First, policy intervention is necessary to reduce the net gap between the purchase price of EVs and ICEVs, as without price parity, dealers have little to no incentives to sell more expensive EVs to neutral shoppers. Moreover, policymakers should recognise both the actors and dynamics at the automotive point of sale; for instance, by developing tax systems that explicitly address capital costs of EVs instead of to costs of ownership. Furthermore, at an industry and business level, training schemes for dealers and educational programmes for customers can significantly improve sales

techniques, knowledge, and confidence in EV technology. This can help operationalise sales processes and reduce the time spent per EV sale. Finally, government should encourage car dealerships, through a potential standard or reward scheme, to revise sales commission and compensation structures to increase the willingness of dealerships and salespersons to engage with EV technology. At the city level, planners in Malmo, Lund, Copenhagen, and Aarhus in particular must recognise that our study experienced ~0% likelihood that consumers would decide to purchase vehicles at dealerships within their territory. Planners in Oslo, by contrast, have certainly cultivated a strong, comparatively supportive environment for EVs. Future research should consider local and national policies when analysing dealership motives and influence on the diffusion of EVs.

Ultimately, the implication seems to be that EVs are at a severe disadvantage at the point of sale when competing with petrol and diesel options. Without more progressive action on behalf of industry and government, dealers have little to no incentive to properly sell EVs, even in a Nordic region so steadfastly committed to decarbonising transport.

## **Methods**

### **Mystery Shopper Approach**

This study was designed to investigate experiences and perceptions at the point of sale from the perspective of an average, or mass market, consumer and assess the likeliness of an ordinary person choosing to purchase an EV as opposed to a petrol or diesel vehicle (EV purchase likelihood). Researchers visited car dealerships and engaged with sales staff as customers, enquiring about vehicle options and purchasing advice, with the aim to obtain insights of the sales strategies of dealerships, attitudes towards particular vehicle types, existence, intent and level of influence when trying to sell a vehicle. We used a “mystery shopper”<sup>29</sup> approach to test the consumer experience when trying to purchase a vehicle at a car dealership. The shopping visits followed suggestions of Wilson, who infers that mystery shopping for car dealerships should be a basic enquiry that needs no follow-up, and leaves no lead for serious purchase<sup>29</sup>. The mystery shoppers—two of the authors (male adults, ages 26-34)—did not show any initial orientation towards EVs and rather allowed the salesperson to guide the sales conversation. More specifically, the study intended to measure if EVs were included within the sales conversation and the direction (positive or negative) of the advice given regarding EVs.

We visited 126 car dealerships between October 2016 and June 2017 across 15 cities in the countries of Denmark, Finland, Iceland, Sweden and Norway. The visits were conducted typically in the capital, the second most populous city and the largest rural town of each country: Aalborg (Denmark), Aarhus (Denmark), Akureyri (Iceland), Copenhagen (Denmark), Gothenburg (Sweden), Helsinki (Finland), Malmo and Lund (Sweden), Oslo (Norway), Oulu (Finland), Reykjavik (Iceland), Stockholm (Sweden), Tampere (Finland), Tromsø (Norway), and Trondheim (Norway). Dealerships varied in whether they were brand-specific or multi-brand, and whether they were EV-certified and non-EV-brand dealerships.

Following the mystery approach<sup>29</sup>, the shopping visits were fairly short experiences, usually 10 minutes. This approach allowed us to mitigate some of the ethical concerns of mystery shopping, especially since the researchers themselves showed no intention of purchasing a vehicle<sup>30,31</sup>. The shopping encounters were anonymised (see Supplementary Note 4). To mitigate potential biases and ensure representativeness of the study shopping visits included a distribution of times of day (across dealer’s working hours, 9:00-17:00), dealership types (multi-brand and brand-specific dealers, as well as EV certified and non-EV certified), two

mystery shopper profiles, and geography (as noted above, 15 cities in 5 different countries). Pilot testing was conducted at one dealership per country visited, where shoppers tested the mystery shopping method considering changing local conditions such as vehicle prices. The mystery shoppers did not show any initial orientation towards EVs and rather allowed the salesperson to guide the sales conversation.

After each dealership visit, the mystery shoppers recorded three sets of data in an audio file including the responses to the dealership visit questionnaire, dealership characteristics, and notes on their shopping experiences including individual thoughts and relevant quotes from the salesperson. Promotional material provided by dealers (leaflets and price lists), dealer's business card and in some cases photographs of advertisement, charging infrastructure and dealership location were also collected.

### **Dealership visit evaluation criteria**

To understand the dynamics at the automotive point of sale, mystery shoppers completed a five-item questionnaire (evaluation criteria) after each visit (see Supplementary Table 1) to assess the Salespersonship Quality, ICEV Orientation, EV Orientation, EV Knowledge and EV Purchase Likelihood for each of the car dealership visits. Salespersonship quality was assessed based on the salesperson's perceived professionalism, attitude, enthusiasm and ability to sell and service the customer<sup>25</sup>. Technological orientation was assessed based on the direction and strength of steering into either ICEVs or EVs (ICEV Orientation and EV Orientation). This was based on the sales advice, promotional material provided, the inclination and willingness of the salesperson to promote either technology. Displayed EV knowledge was evaluated in terms of the amount and accuracy of information provided, regardless of whether it communicated positive or negative EV attributes. Lastly, based on the overall shopping encounter, and considering all experienced dynamics, the mystery shoppers assessed the likelihood of considering an EV purchase for their next vehicle after each dealership visit. Each item was rated on a 5-point Likert scale in 0.5 point increments.

### **Dealership visit variables**

We recorded nine variables for each of the 126 visits conducted (see Supplementary Table 2). The country and city of each dealership were recorded to determine if and how market conditions impacted the automotive point of sale, in particular EV purchasing (EV purchase likelihood). This also allowed us to test the point of sale from the perspective of different levels of market development, as Norway is quickly moving into early mass to mass EV markets, whereas the other four countries are at much earlier phases; considering that Denmark is the first country in which EV sales have recently slowed down significantly. Moreover, testing dealerships in different cities allowed us to assess the impact of the point of sale within different levels of urbanization and rural locations, such as northern towns of Trømsø, Oulu and Akureyri.

We visited multi-brand and brand-specific, as well as EV-certified and non-EV-certified dealers. Out of the total sample, 42% were multi-brand and 58% were brand-specific dealers; 66% were EV-certified dealers. Interestingly, from our visits Finland and Denmark show a high percentage of EV-certified dealers within the visits conducted per country with ~75% and ~68% respectively, just after Norway (78%). Moreover, in the study we created two socio-economic profiles (Shopper), a PhD student (LN=0) and a business consultant, to test how other variables such as the availability of EVs for different segments, the sales approach

and whether the attitude of the dealer changed based on higher budget expectations. Unexpectedly, the economic characteristics of the shopper profiles, such as budget, were not often involved in the sales conversation as salespeople would often base their assessment on ranking vehicle offerings by showing the lowest priced vehicle upwards, the driving patterns (commuting or leisure), comfort (available space in the vehicle), and technological specifications, such as fuel efficiency, horse power, and technology packages (radio, air conditioning, etc.).

The gender and age of the dealers were recorded to determine if these variables influenced dealer assessments. Despite the fact that all the Nordic countries tested rank at the top of global English proficiency by non-native speakers, we considered language limitations. Language limitations were only reported in 8 visits, but were not considered as a barrier.

### **Expert Interviews**

The primary data collection and analysis of the mystery shopping experiences was triangulated with 30 expert interviews with automotive manufacturers, importers, associations and other related organisations (see SI, Supplementary Note 5). These interviews are taken out of a pool of 227 expert interviews with more than 250 respondents to investigate the socio-technical barriers for electric mobility in the Nordic region, also conducted by the authors between 2016-2017. This larger interview pool follows a semi-structured approach, and therefore allowed for directly related topics, in this case car dealerships, salespersons and the automotive point of sale, to arise during the interview conversation. Based on this, we selected the interview answers used here. Interview duration was between 30 and 90 minutes, and interviews were fully transcribed and coded in NVIVO 11.

### **Data analysis**

The data from audio files of each car dealership visit were transcribed and analysed. The notes and quotes recorded by the mystery shoppers were coded and evaluated based on a frequency analysis, (see Table 1 above). Moreover, dealership characteristics and the ranked answers to the designed questionnaire were analysed in three ways. Descriptive statistical analysis in Excel such as percentages, totals and averages were used to determine the overall status of the point of sale. Second, analysis of variance and single linear regressions were conducted to identify relationships between variables; and third, multilevel regression models were used to identify key determinants that influence EV purchase likelihood. Regression models included a one-way, two-way interaction variations as well as a tobit model following a backward elimination criteria that considers all variables (including dummification of categorical variables), and considering the Corrected Akaike's Information Criteria (AICC) as a measure of model fit when comparing alternative models<sup>32</sup>. The ANOVA and regression models were conducted in SAS 9.4.

### **Data Availability Statement (DAS)**

The data that support the plots within this paper and other findings of this study are available from the corresponding author upon reasonable request. Due to ethical concerns, full supporting data from the visits or interviews cannot be made openly available.

### **Ethics Statement**

We confirm that informed consent was obtained from all interview participants.

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#### **Author contributions**

The idea and design for the research was co-developed by all authors. G.Z.R led the implementation of the study. G.Z.R and L.N conducted all field research and data analysis. All authors contributed to writing the paper.

#### **Competing financial and non-financial interests.**

G.Z.R and B.S.K declare no competing financial interests. L.N has a financial interest as consultant in a start-up company that is establishing businesses to provide grid services from EVs. B.K.S is on the editorial advisory board of *Nature Energy*.